

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	RICHAUD, Johan L. et al.
Title	MULTI-OUTLET CASTING NOZZLE
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Examiner	Kastler, Scott R.
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AMENDMENT PURSUANT TO 37 C.F.R. § 1.312

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Commissioner for Patents
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In response to the Notice of Allowance and Fee(s) Due mailed on April 13, 2009, applicants request amendment of claims 29 and 42 according to the accompanying list of claims. Applicants also request the amendment of Paragraphs [0015], [0034] and [0035] in the specification. Replacement paragraphs [0015], [0034] and [0035], marked to indicate changes, are provided herewith.

[0015] It is a further object of the present invention to provide a submerged entry nozzle for use in the continuous casting of liquid metal, the nozzle comprising a body having a central bore through most of the body, the bore terminating in a closed end and a plurality of pairs of discharge outlets symmetrically disposed about a longitudinal axis of the nozzle characterized in that the cross-sectional area of the central bore decreases between pairs of discharge outlets, and wherein the width of outlets closer to the closed end of the nozzle have the same width as ~~nozzles~~ outlets further from the closed end of the nozzle.

[0034] FIGS. 8 and 9 illustrate a first embodiment of a casting nozzle 2. This embodiment of the invention comprises one opposing pair of upper lateral outlets 30 and one opposing pair of lower lateral outlets 32. In this embodiment the design turning angle α from the vertical upward toward the horizontal of the upper outlets is 90 degrees as is the design turning angle β of the lower outlets 32. Each upper outlet 30 is defined by an upper edge 22 and a lower edge 24. The central bore 26 of the casting nozzle 20 is laterally constricted by the lower edges 24 of the upper outlets 30. The lateral constriction is formed by the intrusion of only the lower edges 24 of the upper outlets 30 into the central bore 26 and thus the lateral opening of the central bore 26 above the upper edges 22 of the upper outlets 30 is greater than the lateral opening of the central bore 26 at the lower edges 24 of the upper outlets 30.

[0035] The lower outlets 32 are located below the constriction and above a bottom closure 36. A lateral constriction does not take the form of a circumferential ledge-like surface that extends around the entire perimeter of the central bore 26 of the nozzle 20. As can be seen in FIG. 9, a lateral constriction only reduces the lateral opening of the central bore 26, and thus the dimension of the central bore 26 opening at 90 degrees to the lateral opening is unchanged. The design turning angles α , β of the upper and lower outlets 30, 32 need not be necessarily equal to 90 degrees. Also the design turning angles α , β of the upper and lower outlets 30, 32 can differ. In either case, the design turning angles α , β may be in the range of 30 to 105 degrees as measured from the vertical upward toward the horizontal in order that the nozzle 20 achieves multiple exit streams turned nearly horizontally relative to the vertical central bore 26.